10658020 - 12-08-03

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : A63H 3/36, 3/46

A2

(11) International Publication Number: **WO 94/01188**

(43) International Publication Date: 20 January 1994 (20.01.94)

(21) International Application Number: PCT/GB93/01468

(22) International Filing Date: 13 July 1993 (13.07.93)

(30) Priority data:

9214927.7	14 July 1992 (14.07.92)	GB
9224982.0	28 November 1992 (28.11.92)	GB

(71)(72) Applicant and Inventor: SAUNDERS, Darren, Gareth [GB/GB]; Ravenswood Park, Bonvilston, Near Cardiff, South Glamorgan CF5 6TR (GB).

(74) Agents: NEWELL, William, Joseph et al.; Wynne-Jones, Laine & James, Morgan Arcade Chambers, 33 St. Mary Street, Cardiff CF1 2AB (GB).

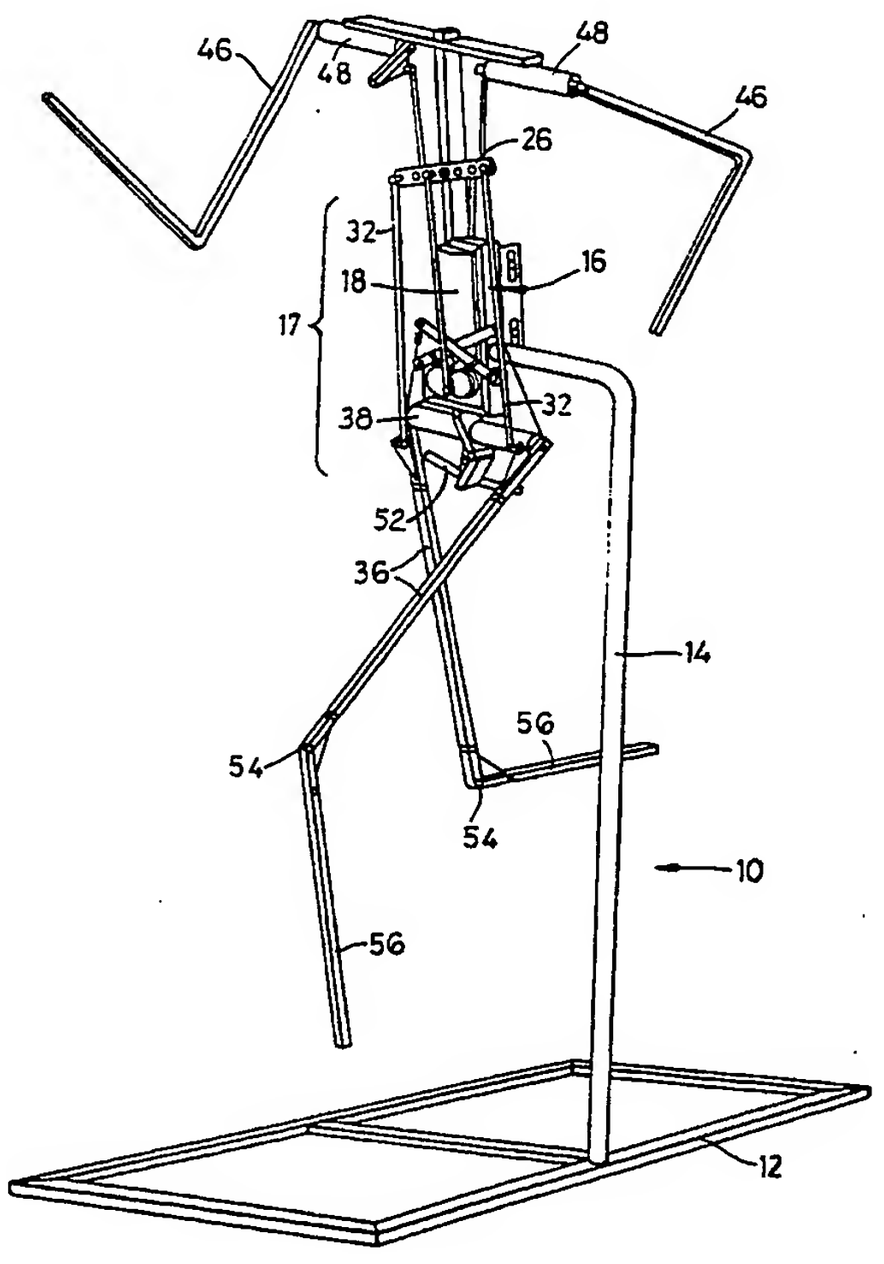
(81) Designated States: AU, CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: ANIMATED DISPLAY

(57) Abstract

An animated display comprises a frame (16), arms (46) pivotted to an upper part of the frame and articulated legs (36, 54, 55) pivotted to a lower part of the frame. The arms and legs are pivotted and articulated by a common drive which includes a rocker bar (26) driven by an electric motor (18).



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**FR**	France	**MR**	Mauritania
AU	Australia	**GA**	Gabon	**MW**	Malawi
BB	Barbados	**GB**	United Kingdom	**NE**	Niger
BE	Belgium	**GN**	Guinea	**NL**	Netherlands
BF	Burkina Faso	**GR**	Greece	**NO**	Norway
BG	Bulgaria	**HU**	Hungary	**NZ**	New Zealand
BJ	Benin	**IE**	Ireland	**PL**	Poland
BR	Brazil	**IT**	Italy	**PT**	Portugal
BY	Belarus	**JP**	Japan	**RO**	Romania
CA	Canada	**KP**	Democratic People's Republic of Korea	**RU**	Russian Federation
CF	Central African Republic			**SD**	Sudan
CG	Congo	**KR**	Republic of Korea	**SE**	Sweden
CH	Switzerland	**KZ**	Kazakhstan	**SI**	Slovenia
CI	Côte d'Ivoire	**LI**	Liechtenstein	**SK**	Slovak Republic
CM	Cameroon	**LK**	Sri Lanka	**SN**	Senegal
CN	China	**LU**	Luxembourg	**TD**	Chad
CS	Czechoslovakia	**LV**	Latvia	**TG**	Togo
CZ	Czech Republic	**MC**	Monaco	**UA**	Ukraine
DE	Germany	**MG**	Madagascar	**US**	United States of America
DK	Denmark	**ML**	Mali	**UZ**	Uzbekistan
ES	Spain	**MN**	Mongolia	**VN**	Viet Nam
FI	Finland				

ANIMATED DISPLAY

This invention relates to an animated display and in particular, though not exclusively, to such a display which reproduces the walking or running action of the male or female human body.

Animated displays exist at present for so-called animated tableaux seen in shops and arcades, and other public places around Christmas time, or on fairground organs and so on. In such displays each figure is only capable of very limited movement, for example turning the head back and forth, or raising and lowering an arm, and the display does not simulate lifelike movement. With such existing arrangements it is difficult if not impossible to provide realistic fluid movement.

Complex animatronic devices exist for simulating human or animal movements but these are extremely expensive to produce and require extensive computer or electronic programming.

I have found that by selecting a natural rhythmic motion of a human or animal, such as walking or running, it is possible to provide an apparatus operating on a cyclic basis for reproducing a fluid movement of the human or animal action without requiring the complexity of construction, or programming of the animatronic display .

Accordingly, in one aspect, this invention provides an animated display comprising a support frame means, two leg members pivotally mounted in an upper end region with

respect to said support frame means, and drive means for reciprocating said leg members thereby to simulate the walking or running action of a human or animal.

In this invention, the term "running" should be interpreted broadly as including jogging, walking, and sprinting.

In another aspect, this invention provides an articulatable limb for simulating a human or animal limb or tail or other flexible body part, which comprises an inner articulatable frame part at least partially encased by a casing of foam, rubber, or rubber-like material.

Whilst the invention has been described above it includes any inventive combinations of the features set out above or in the following description.

The invention may be performed in various ways and two embodiments and methods of construction thereof will now be described in detail, reference being made to the accompanying drawings in which:-

Figure 1 is a general perspective view of a first embodiment of animated display for simulating the walking or running action of a human;

Figure 2 is a front view of the central part of the embodiment of Figure 1;

Figure 3 is a side view of the central part of the embodiment of Figure 1;

Figures 4 (a),(b),(c) are views showing the cam profiles for the embodiment of Figure 1, for sprinting, jogging and walking respectively;

Figure 5 is a montage showing the arm and leg movements of a human sprinting;

Figure 6 is a general perspective view of a second embodiment of animated display for simulating the walking or running action of a human;

Figure 7 is a front view of the central part of the embodiment of Figure 6;

Figure 8 is a side view of the central part of the embodiment of Figure 6;

Figures 9(a) and (b) are schematic views showing a front and side view respectively of an articulated limb and surrounding structure for simulating a human limb for the first or second embodiments.

Referring initially to the embodiment of Figures 1 to 4, the display comprises a support stand 10 having a base 12, and a column 14 of inverted L-shape, the upper free end of which is connected to the support frame 16. The support frame 16 comprises a series of frame sections interconnected to support the drive motor 18 and the moveable limbs of the display. The drive motor drives a mechanism 17 which controls the movements of the limbs. This mechanism is indicated generally in Figure 1 but in more detail in Figures 2 and 3; the motor drives, via a 90° gearbox, two symmetrically opposed cams 20',20'' whose function will be explained below. Eccentrically mounted on the outer cam 20'' is a projecting finger 22 terminating in a ball which fits in a socket in the end of a link 24. The other end of the link has a socket which fits over a finger 28' attached

to a rocking bar 26 pivotally mounted at 30 to an upper region of the frame 16. The rocking bar 26 has five further projecting fingers which drive the arms, legs and hip sway mechanism in required phase.

Thus, the outermost fingers 28'' at either end of the rocking bar are connected via ball and socket joints to respective left and right links 32 which connect at their lower ends to transversely extending fingers which project from triangular fillets 34 which are attached to the front of the upper part or thigh 36 of the legs. At their upper ends the thighs are pivotally connected to a transverse hip shaft 38 secured to the support frame.

The two next inner fingers 28''' are attached via ball and socket joints and links 40 to fingers 42 on triangular shoulder fillets 44 connected to inner ends of the arm members 46. Each arm member is pivotally mounted on the support frame 16 by a shoulder tube 48.

The inner finger 28'''' symmetrically opposed to the drive finger 28' is connected via a link 50 and ball joints to a curved hip bar 52 which moves the "buttocks" or "hips" of the mannequin in correct phase with the leg movement to simulate the female moving or walking action. On each side, preferably the hip rises as the leg moves forwardly through the vertical position.

When the motor is switched on, it causes the rocking bar 26 to oscillate through an arc dependent on the eccentricity of the projecting finger 22 relative to the rotati nal axis of the cams 20',20''. The rocking bar thus

causes the left and right thighs to move in antiphase and likewise the left and right arms. Because the leg fillets 34 extend forwardly of the pivotal connection of the hip shaft 38, and the shoulder fillets 44 extend rearwardly of the pivotal connection to the shoulder tube, on each side of the body, the arm and leg move in antiphase, i.e. the arm is lifted rearwardly as the leg is lifted forwardly.

At their lower ends, the thighs 36 are articulated at knees 54 to lower leg members 56. Articulation of each leg is controlled via a Bowden (RTM) or similar cable drive comprising a cable 58 connected at its lower end to the lower leg and extending through the inner part of the thigh 36, to be connected to the upper end of a respective actuating rod 55. The lower end of each rod is pivotally attached at 59 to the support frame 16, and adjacent the lower end is a roller 60 which acts as a cam follower on a respective cam 20', 20''. As the motor 18 rotates and drives the arms and thighs, so the cams 20' and 20'' articulate the lower legs in a mechanically programmed manner to simulate the required movement.

Ideally, different cams are used for different actions such as sprinting, jogging and walking (see Figures 4(a),(b) and (c)). In each Figure, S denotes the start of the cycle (i.e. when the leg is vertical, in line with the body). and H denotes the highest lift of the lower leg member. Common to each cam profile is a concave region 62, which corresponds to when the foot is in contact with the ground. Apart from this, the separation of the profile from the axis

C determines the extent of lift and as can be seen, this increases with progression from walking, to jogging to running. The cam profiles are designed from analysis of the walking, jogging, sprinting movements of various athletes.

I have also found that the extent of throw, and the centre of throw relative to the body for both the arms and the legs vary according to the speed of movement. In the first embodiment, the extent of throw may be adjusted relatively simply by adjusting the extent of movement of the rocking bar 26, e.g. by adjusting the eccentricity of finger 22. This will adjust the extents of movement of the arms and thighs in common. The centres of throw may be adjusted by extending or shortening the length of the linked connection the rocker bar to the arms 46 and the thighs 36.

Thus, when the motor is operated, the arms, thighs, lower legs and hips/buttocks all move in predetermined relationship. For walking the "body" should be approximately vertical, but for walking, jogging, sprinting, it should lean forward by 10° or so. The extents and orientations of the throws are preferably as set out in the following table:-

	Forward leg throw	Rearward leg throw	Total leg throw	Forward arm throw	Rearward arm throw	Total arm throw
Walk	35°	10°	45°	0°	30°	30°
Jog	40°	10°	50°	0°	60°	60°

Run	50°	15°	65°	15°	70°	85°
Sprint	65°	15°	80°	50°	70°	120°

When walking, the forearm is usually vertical, but when running, jogging, sprinting, it is usually at about 80° to the upper arm.

Figure 5 shows a montage illustrating the motion of one arm and one leg of the human body. From this, the angular positions and articulation throughout the sprinting cycle can be seen.

Referring now to the embodiment of Figures 6 to 8, the arm members, thigh members and lower leg members are pivotally mounted or articulated as above but the mechanism for applying controlled movement to each limb is different. Here, a motor 100 supplies drive to each part by means of a system of toothed belts 102, and pulleys 104.

Reciprocal drive is applied to the arms 105 by means of two oppositely directed cranks 106 at each end of a shaft 108. The cranks each have a projecting drive finger 110 which is located in a slot or guide 112 secured to the arms. As the shaft 108 rotates, so the arms 104 are moved reciprocally.

A similar arrangement drives the legs reciprocally via a shaft 114, cranks 116, and fingers 118 running in slots or guides 120 attached to the upper legs 122.

The lower legs are articulated as before by means of a cable drive. The upper end of each cable 126 passes around

a respective retainer 128 rotatably mounted on a crank 130 secured to the end of a driven shaft 132. As the driven shaft 132 rotates, the upper end of each cable describes a circle, thus alternately lifting and lowering the lower leg, in phase with the movement of the limbs.

Actuation of the motor causes the arms, thighs, and lower legs to move in predetermined manner as determined by the geometry of the system. The extent of throw and centre of throw and the "lift" of the lower leg may be adjusted by adjusting the eccentricity of the cranks and the relative positions of the elements. For example, the drive shafts could be moved forwardly or rearwardly relative to the frame to shift the centre of throw. In this connection it will be noted in Figure 7 that the leg drive shaft 114 is mounted forwardly of the frame.

Referring now to Figure 9(a) and (b), a preferred form of construction for the legs of a display comprises articulated leg frame members 150,152 hinged or pivoted at 154, similar to the arrangements shown in the two above embodiments. Surrounding the members 150,152 is a flexible tubular element 156 reinforced against collapsing by a spiral-wound rib 158, and secured to the leg members by spacer elements 160. Towards the upper end of the upper leg or thigh member 150 the spacer members are slotted so that they allow limited lateral movement of the tube and the foam 162 and surrounding skin 164 relative to the leg member 150, as shown by arrows A. The tubular element 158 is surrounded by foam 162 which is encased by a rubber skin 164. In front

of the hinge or pivot 154 is a simulated patella 166 which "floats" between the tubular element and the skin. The patella is preferably relatively rigid and may comprise a stiff rubber insert.

The leg may be made by forming a plaster mould corresponding to the outer surface of the leg, swill moulding a latex outer "skin" by introducing latex into the mould, leaving it there for 1-2 hours until a skin 164 of required thickness has fully or partially set, swilling out the liquid latex and leaving the skin 164 to cure or dry. Once the skin 164 is cured/dry, an assembly comprising the leg frame members 150,152 and the tubular element 156 is located in the correct position within the skin 164, with the patella 166 if required, and then the space between the skin 164 and the tubular element 156 filled with a foam or foamable material 162. Thereafter the formed limb may be removed from the mould. This construction allows realistic flexing movement of the leg without collapse at the knee.

In some applications, the tubular element may be replaced by a perforate member or a helically wound reinforcement such as a spring.

It will be understood that the buttocks may be simulated in a manner similar to the patella, e.g. by providing a floating cup- or dish-shaped insert of less compressible material in the foam filling. In this case, the buttock inserts can be attached to the hip bar 52 to impart a lifelike swaying action for a female model. The inserts and swaying mechanism h ld the buttocks of the

display in place and avoid any tendency to collapse.

For male models, the buttocks may be attached to a fixed hip bar.

CLAIMS

1. An animated display, comprising a support frame means, two leg members pivotally mounted in an upper end region with respect to said frame means and drive means for reciprocating said leg members.

2. An animated display according to Claim 1, wherein said drive means comprises a rotary drive means connected to a rocking drive member pivotally mounted on said frame means and respective link means connecting each leg member to said rocking drive member whereby movement of said rocking drive member applies reciprocal movement to said leg members.

3. An animated display according to Claim 6, including a hip simulating region comprising one or more surfaces for being moved to simulate the movement of a female's hips, and a hip rocker member for moving said one or more surfaces, said hip rocker member being connected by link means to said rocking drive member, to move in predetermined relationship with said leg members.

4. An animated display according to any preceding claim, wherein each of said leg members comprises an upper leg part articulated at a knee joint to a lower leg part.

5. An animated display according to Claim 4, including articulating means for articulating each leg member in predetermined relationship with said reciprocal pivotal movement.

6. An animated display according to Claim 5, when dependent on Claim 2, wherein the articulating m ans

comprises, for each leg member, an elongate flexible element extending along at least part of the upper leg part and connected at one end to said lower leg part, the flexible element being extensible or retractable to allow or impart articulation of said leg member, and extension/retraction means for extending and retracting said elongate flexible member.

7. An animated display according to Claim 6, wherein said extension/retraction means includes a cam follower means associated with said flexible element and a cam means driven by said rotary drive means.

8. An animated display according to Claim 5, wherein the profile of said cam means is selected according to the particular action to be simulated by the display.

9. An animated display according to Claim 8, wherein the cam profile is generally convex except for a concave portion corresponding to the period when the lower part of the leg member is adjacent the lowest part of its locus of movement.

10. An animated display according to any preceding claim, including two arm members pivotally mounted on said frame means and arm drive means for reciprocally moving said arm members.

11. An animated display according to Claim 10 when dependent on Claim 2, wherein said arm drive means comprises link means connecting each arm member to said rocking drive member.

12. An animated display according to Claim 1, wherein

said drive means comprises a rotary shaft means which carries two spaced crank arm means each carrying a peg or finger element which engages a respective slot or guide surface in or on each leg member, whereby rotation of said shaft means effects reciprocal pivoting movement of said leg members.

13. An animated display according to Claim 12, wherein each of said leg members comprises an upper leg part articulated at a knee joint to a lower leg part.

14. An animated display according to Claim 13, including articulating means for articulating each leg member in predetermined relationship with said reciprocal pivotal movement.

15. An animated display according to Claim 13, wherein the articulating means comprises, for each leg member, an elongate flexible element extending along at least part of the upper leg part and connected at one end to said lower leg part, the flexible element being extensible or retractable to allow or impart articulation of said leg member, and extension/retraction means for extending and retracting said elongate member.

16. An animated display according to Claim 15, wherein said extension/retraction means includes two eccentric members disposed on a further shaft means.

17. An animated display according to any of Claims 12 to 15, including two arm members pivotally mounted on said frame means and arm drive means for reciprocally moving said arm members.

18. An animated display according to Claim 17, wherein said arm drive means comprises a rotary arm drive shaft means which carries two spaced crank arm means each carrying a peg or finger element which engages a respective slot or guide in or on each arm member, whereby rotation of said shaft means effects reciprocal pivoting movement of said arm members.

19. An animated display according to Claims 12 and 18, wherein at least the rotary shaft means and the arm drive shaft means are driven from a common drive.

20. An animated display according to Claim 19, wherein said common drive comprises a motor connected to a pulley means which drives one or more belts to apply drive to said rotary shaft means and said arm drive shaft means.

21. An animated display according to any preceding claim, wherein each leg member comprises an inner articulated frame part at least partially surrounded by a foam casing to simulate the appearance of a human or animal leg.

22. An animated display according to Claim 21, wherein each inner frame part is disposed within a flexible tubular member and secured therein at locations spaced along its length, said foam casing generally surrounding said tubular member.

23. An animated display according to Claim 22, wherein said tubular member includes helically extending or annular strengthening ribs or elements.

24. An animated display according to any of Claims 21

to 23, wherein said foam casing is at least partially covered by a skin of rubber or rubber-like material.

25. An animated display according to any of Claims 21 to 24, wherein an insert element or region of relatively stiff material is disposed adjacent the articulated region to simulate a patella.

26. An animated display according to any of Claims 21 to 25, wherein said foam casing is mounted on said frame part by means allowing limited movement of the casing relative to the frame part in a direction transverse to the plane of pivotal movement of the leg member.

27. An animated display according to any of Claims 21 to 26, wherein said leg member is made by moulding an outer skin member, locating said articulated frame part within said outer skin member and filling at least part of the space therebetween with a foam or foamable material.

28. An animated display according to any of Claims 21 to 27, wherein at least part of the outer surface of the display is covered with a stretchable covering material.

29. An articulatable limb for simulating a human or animal limb or tail or other flexible body part, comprises an inner articulatable frame part at least partially encased by a casing of foam, rubber, or rubber-like material.

30. An articulatable limb according to Claim 29, wherein said articulatable frame part comprises a skeletal central member jointed or otherwise articulatable and disposed within a tubular outer sleeve, the outer sleeve b ing encased by said foam, rubber or rubber-like material.

31. An animated display substantially as herein described with reference to the accompanying drawings.

31. An articulatable limb substantially as herein described with reference to the accompanying drawings.

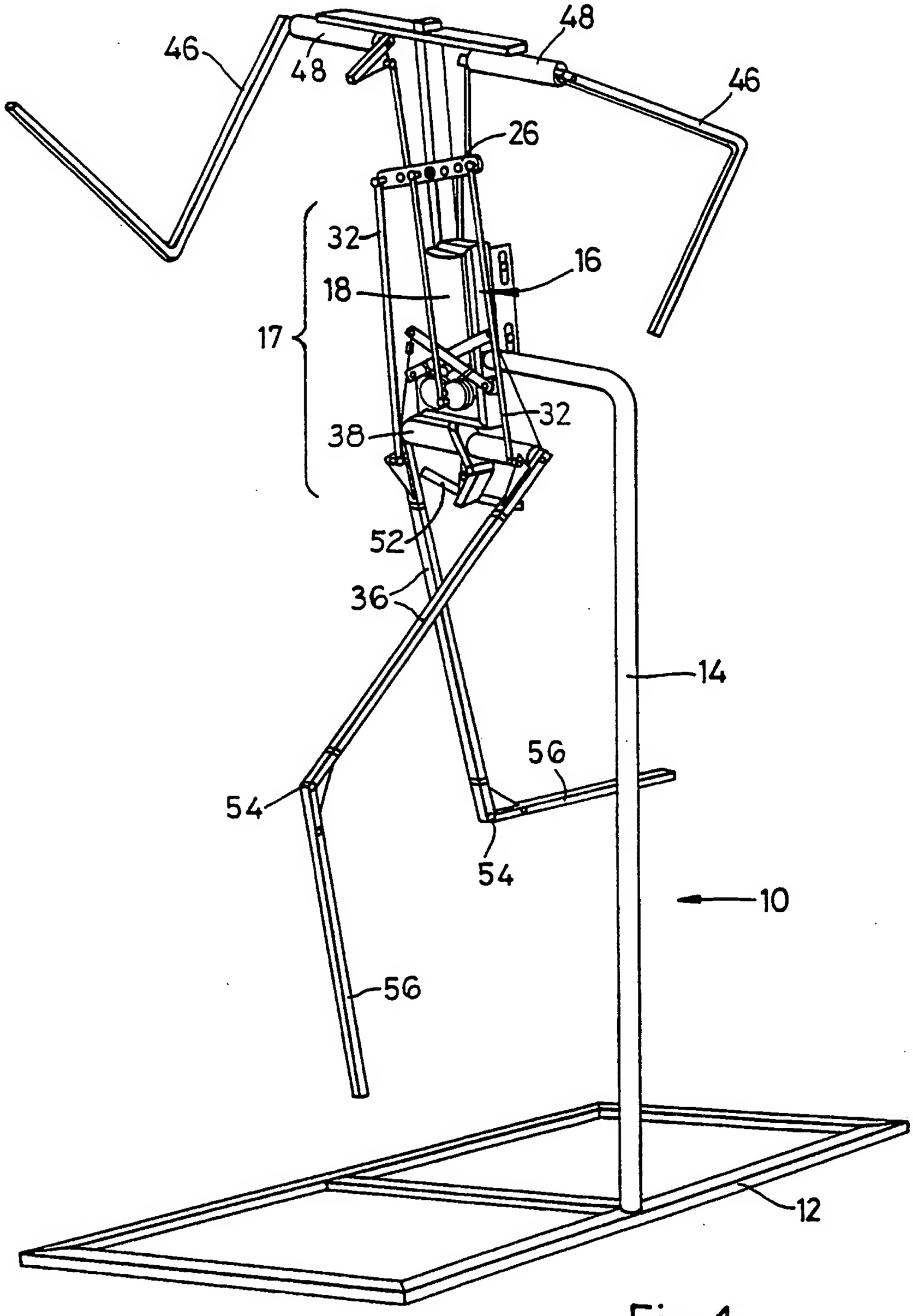


Fig. 1

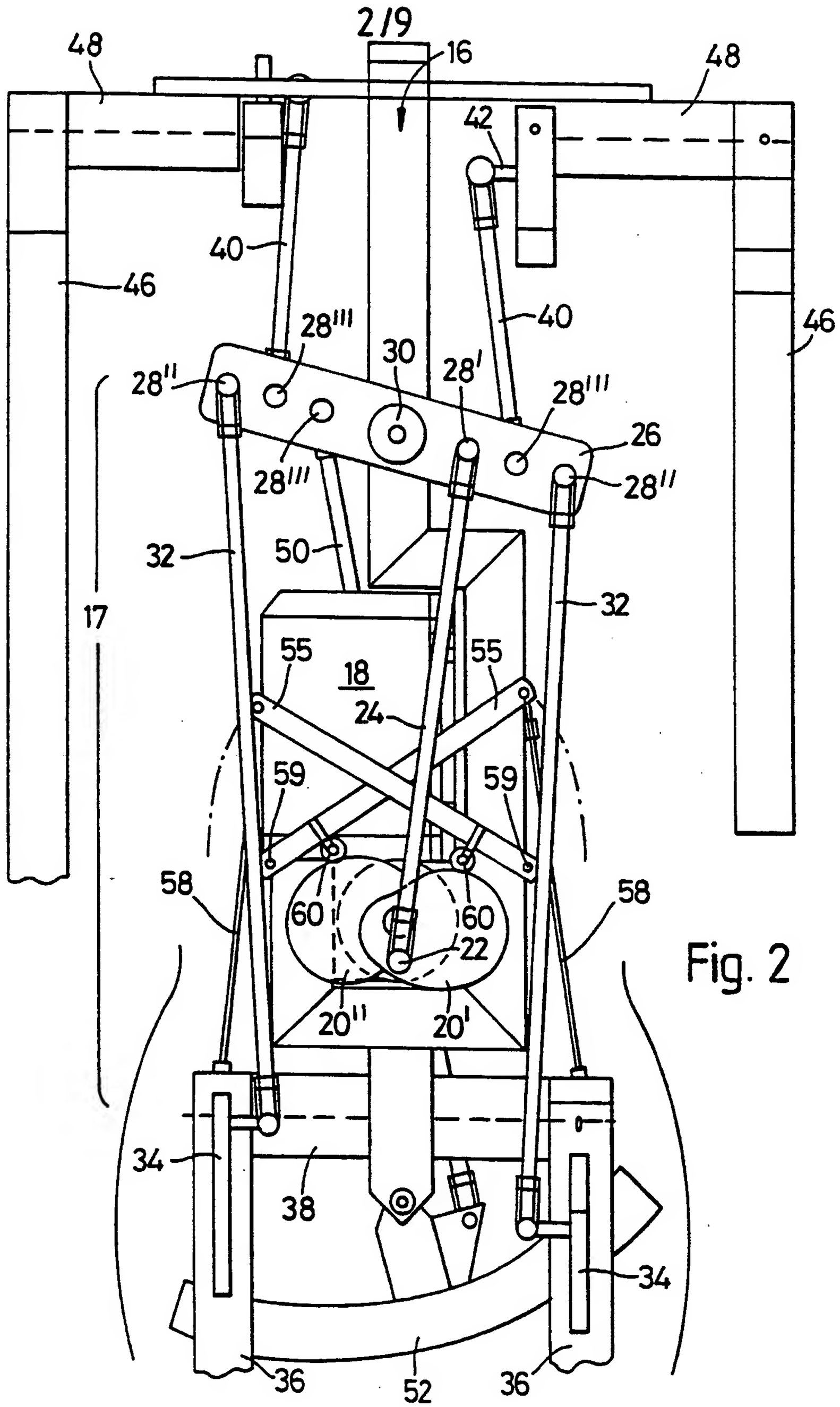

219
16
48
48
42
40
46
40
46
28III
30
28I
28II
28III
28III
26
28II
32
50
32
17
55
18
55
24
59
59
58
58
60
60
22
20II
20I
34
38
34
36
52
36

Fig. 2

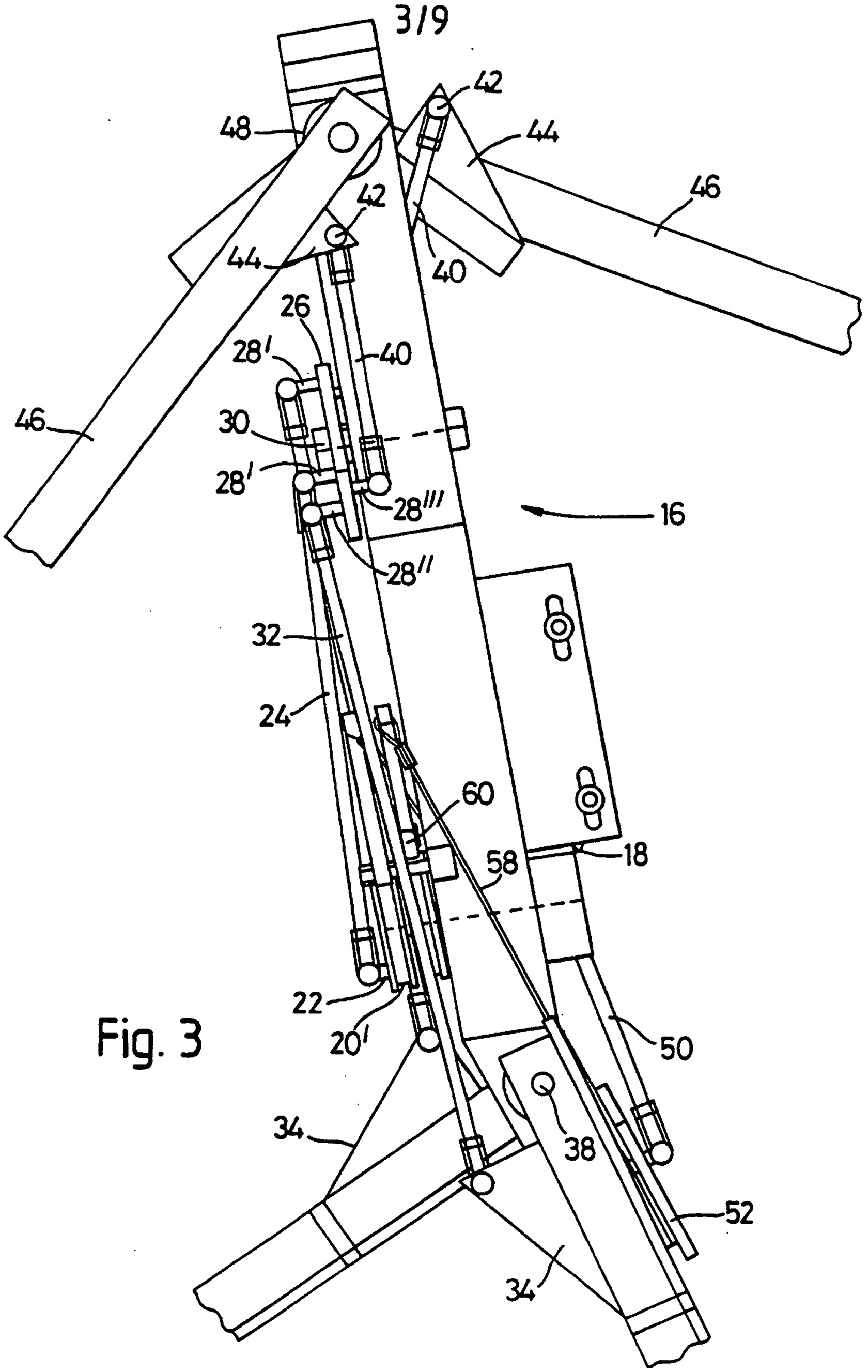
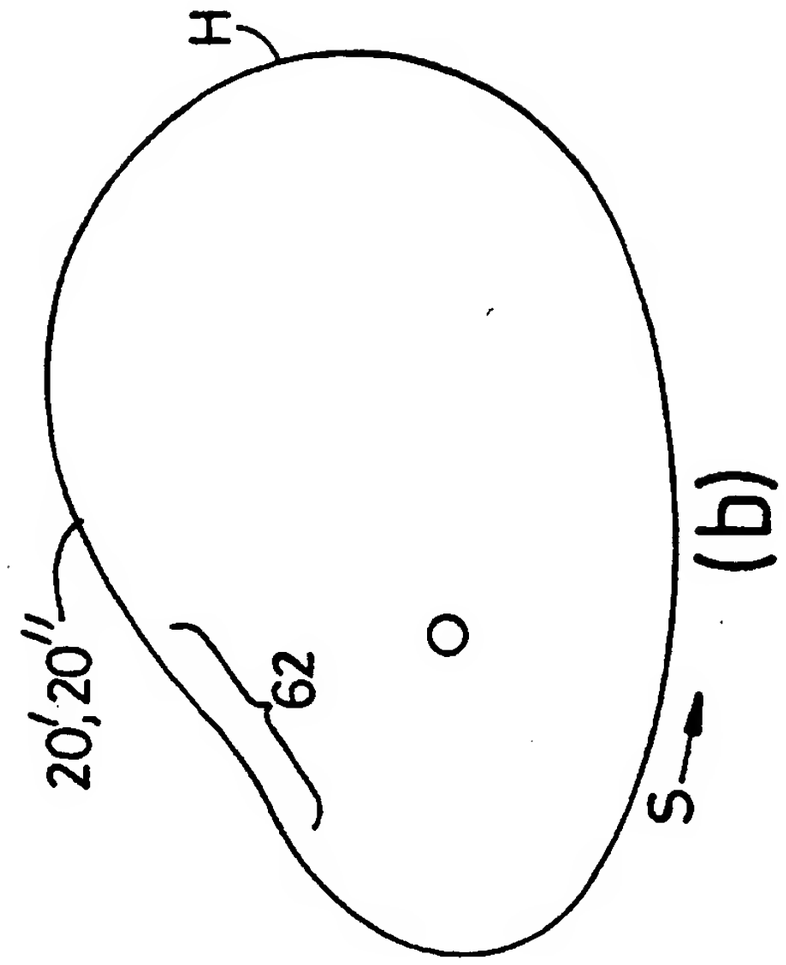
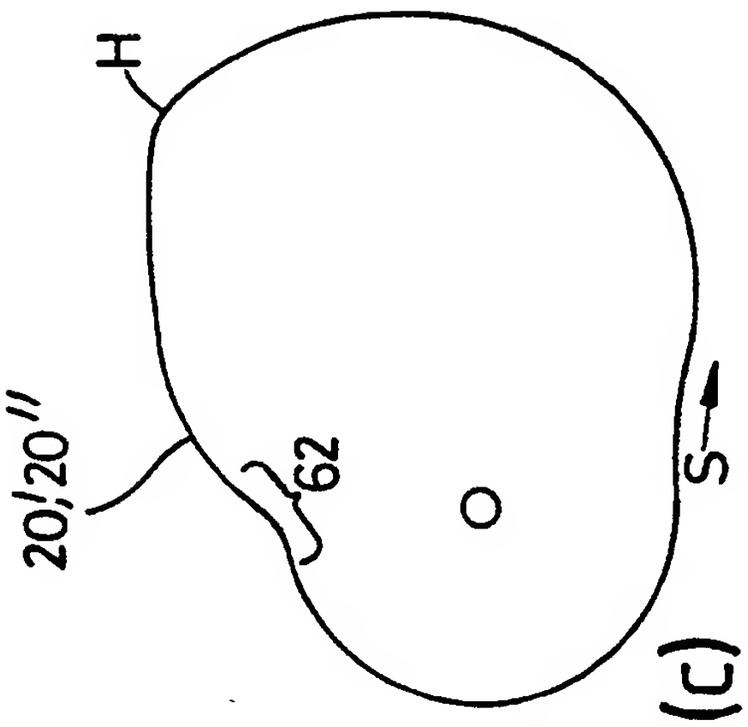

319
42
48
44
46
42
44
40
26
28'
40
46
30
28'
28'''
16
28''
32
24
60
58
18
22
20'
50
34
38
52
34

Fig. 3





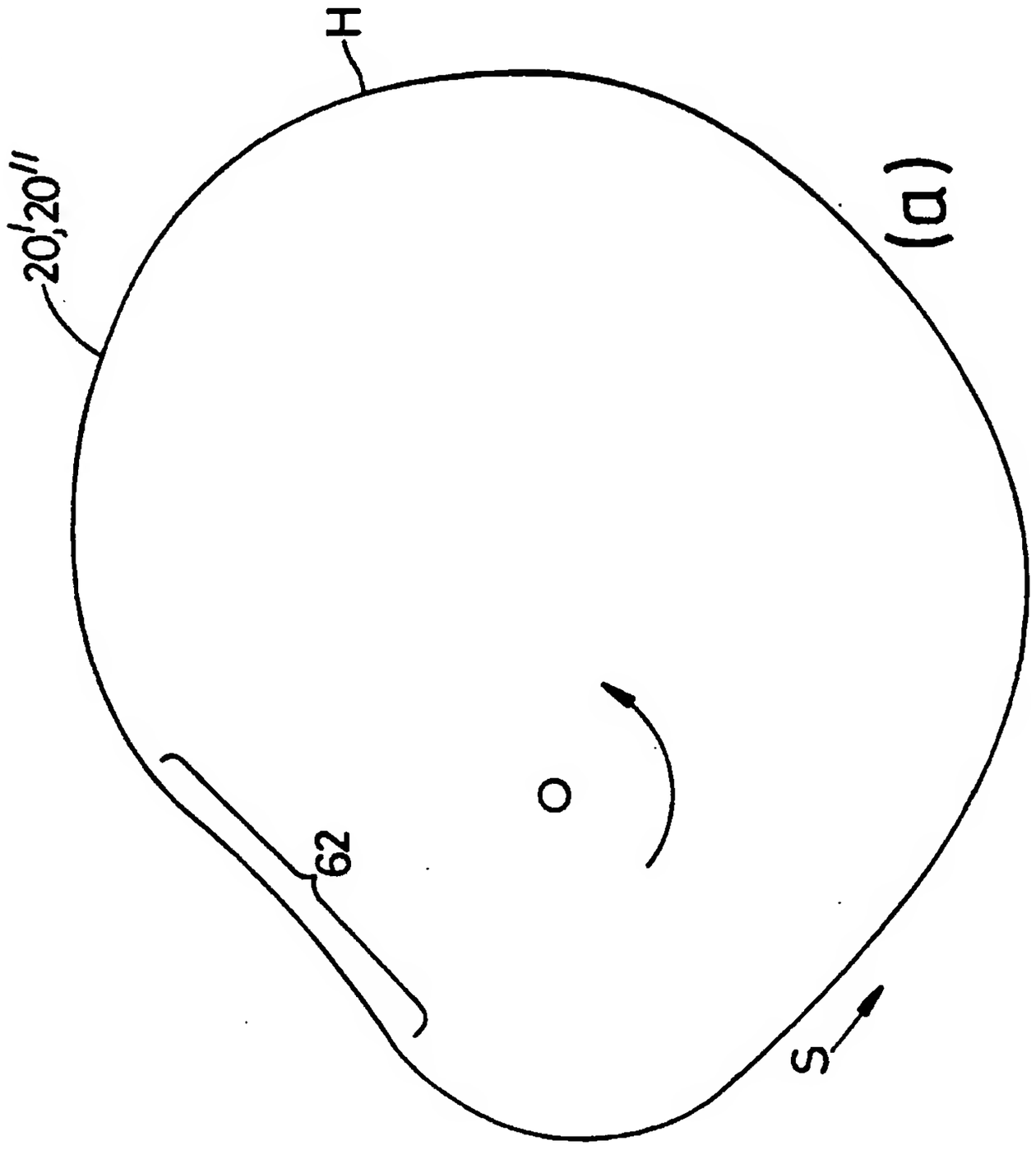


Fig. 4

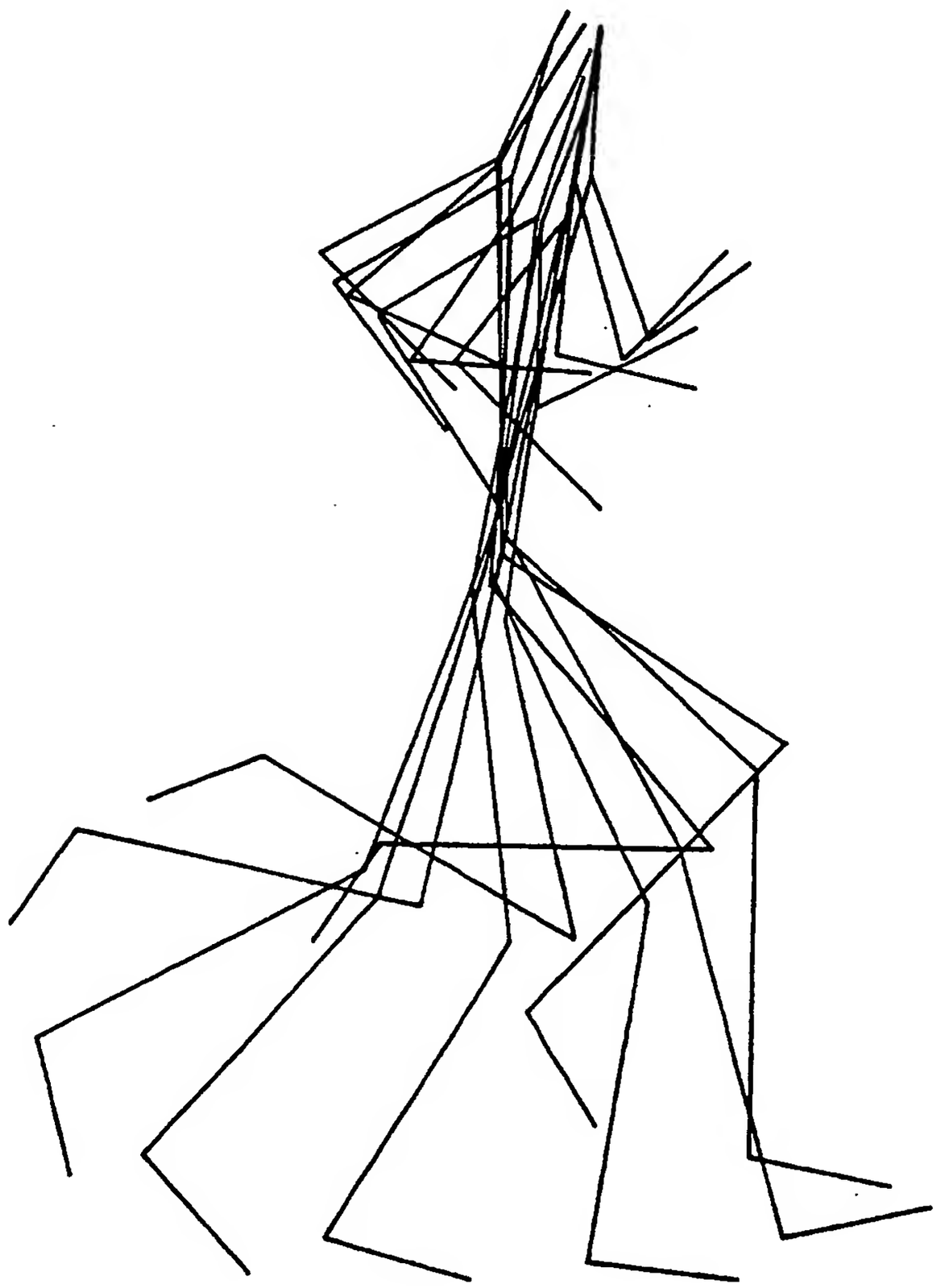


Fig. 5

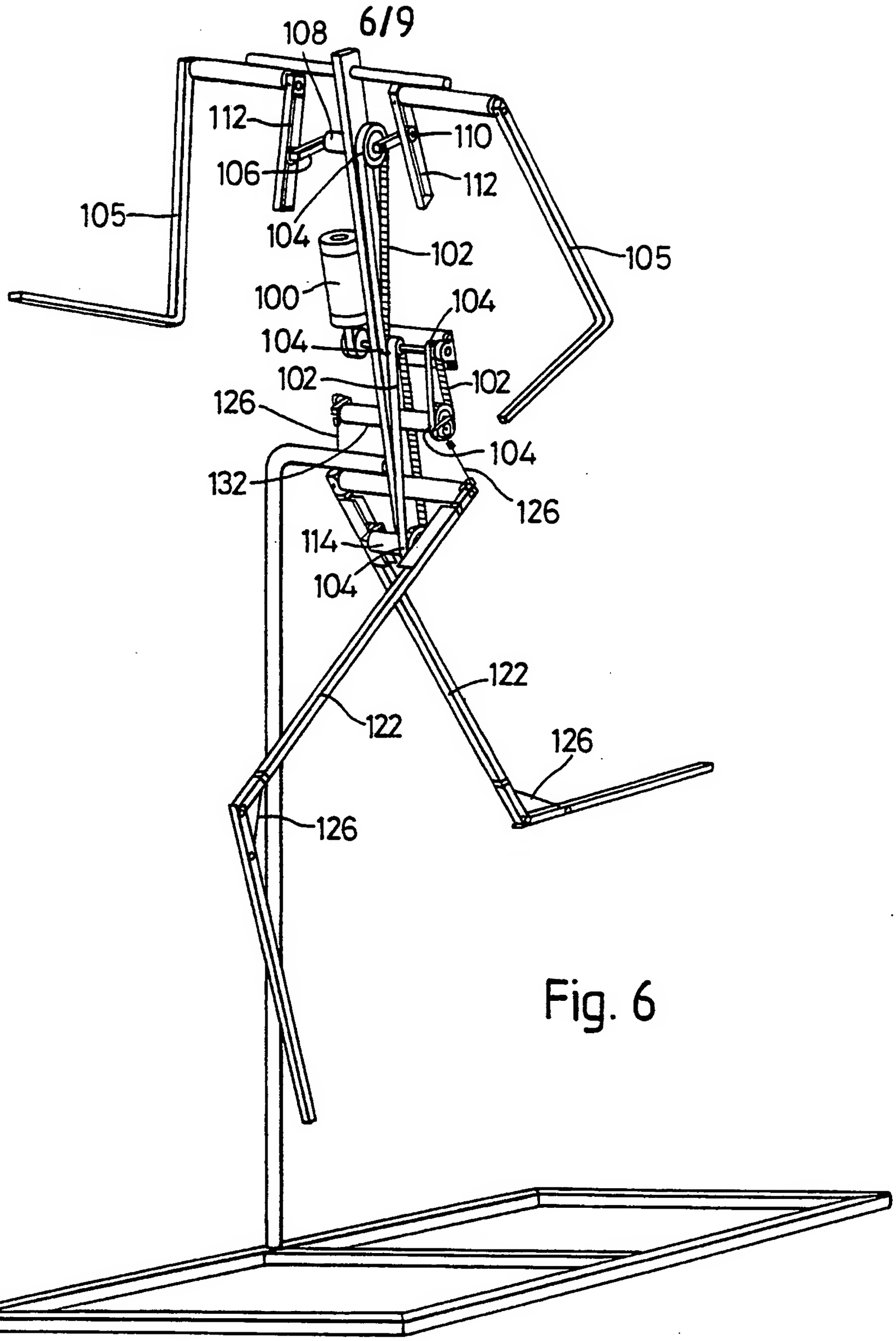

108
112
110
106
112
105
104
102
105
100
104
104
102
102
126
104
132
126
114
104
122
122
126
126

Fig. 6

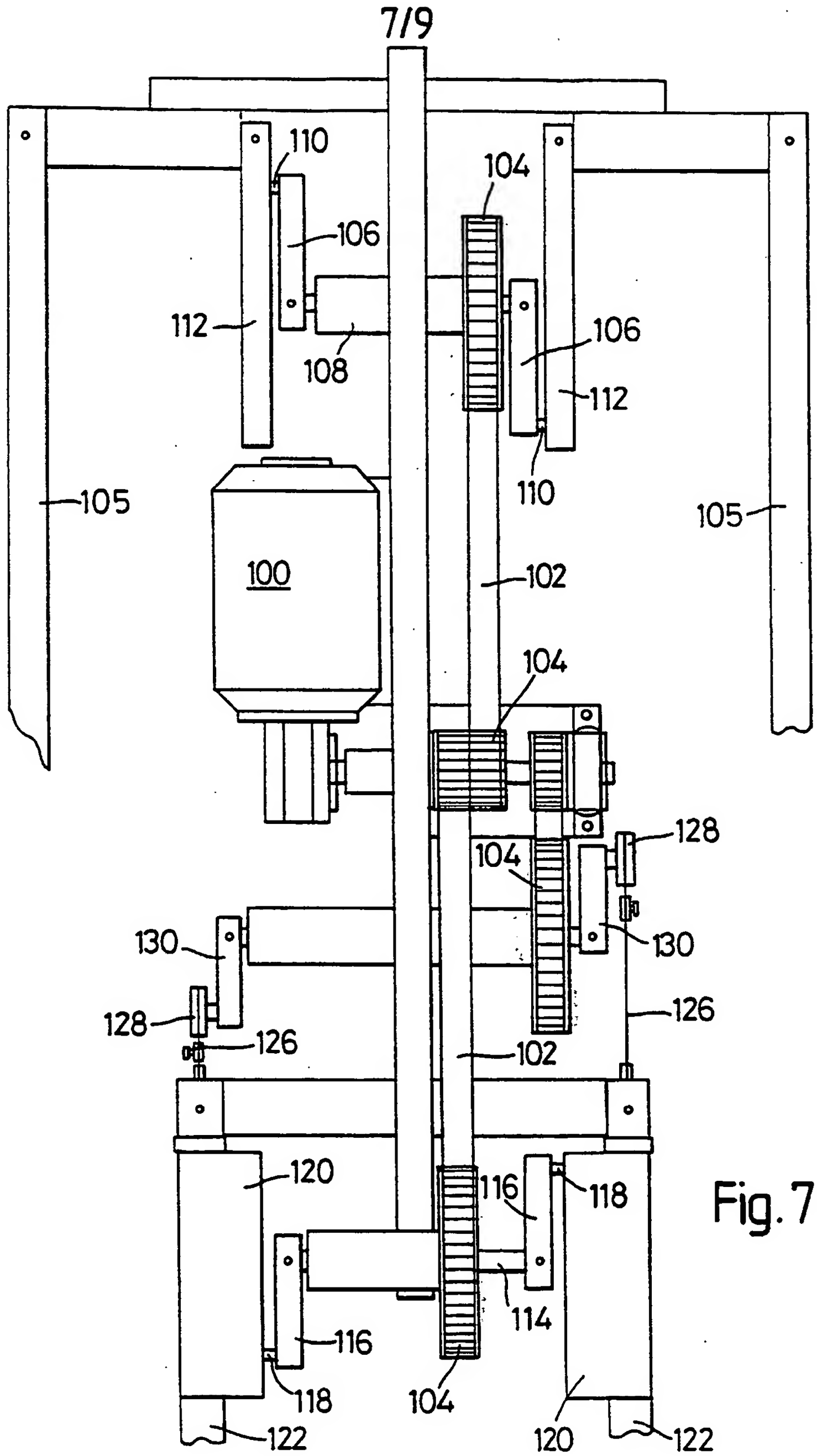

110
104
106
112
108
106
112
105
110
105
100
102
104
128
104
130
130
128
126
126
102
120
116
118
114
116
118
104
120
122
122

Fig. 7

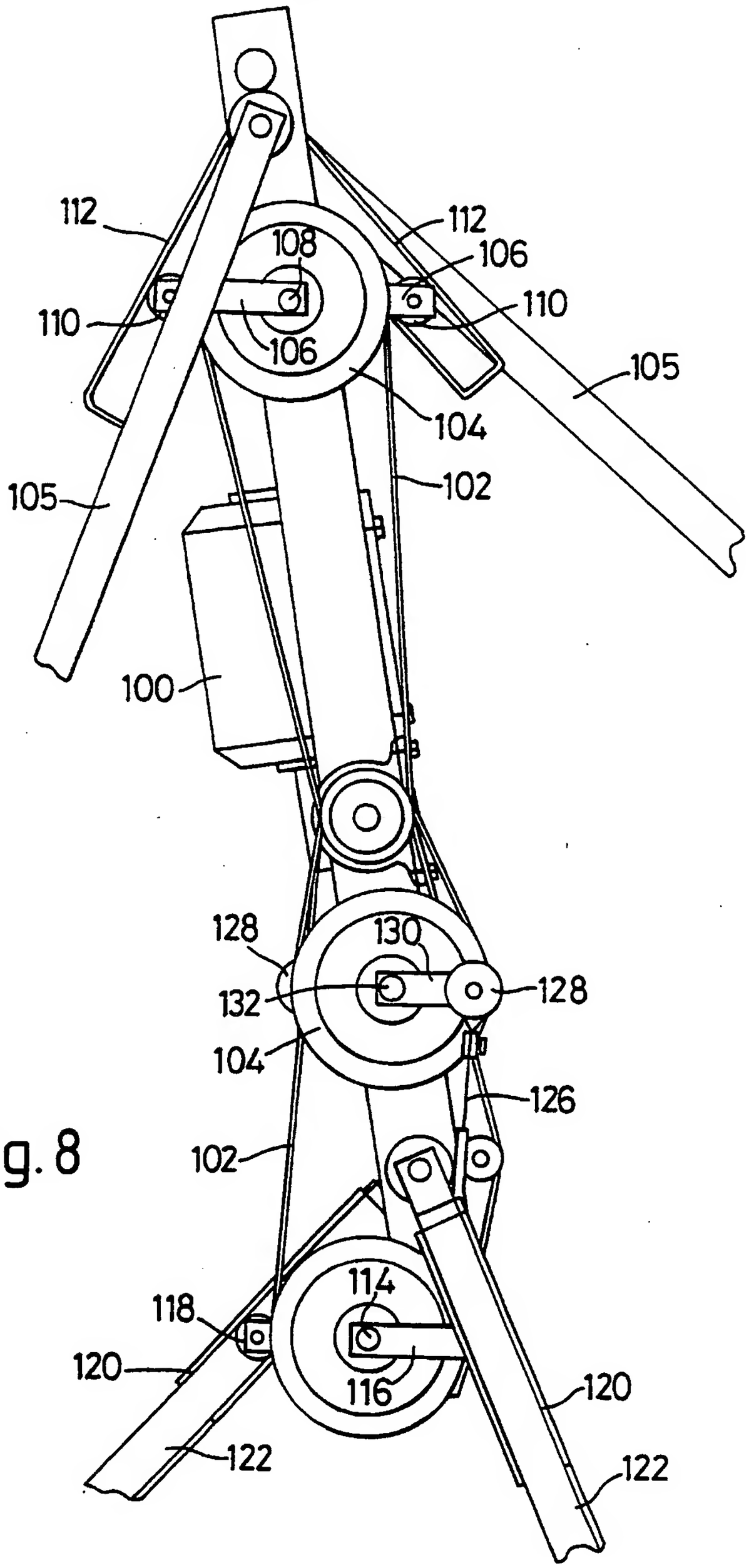
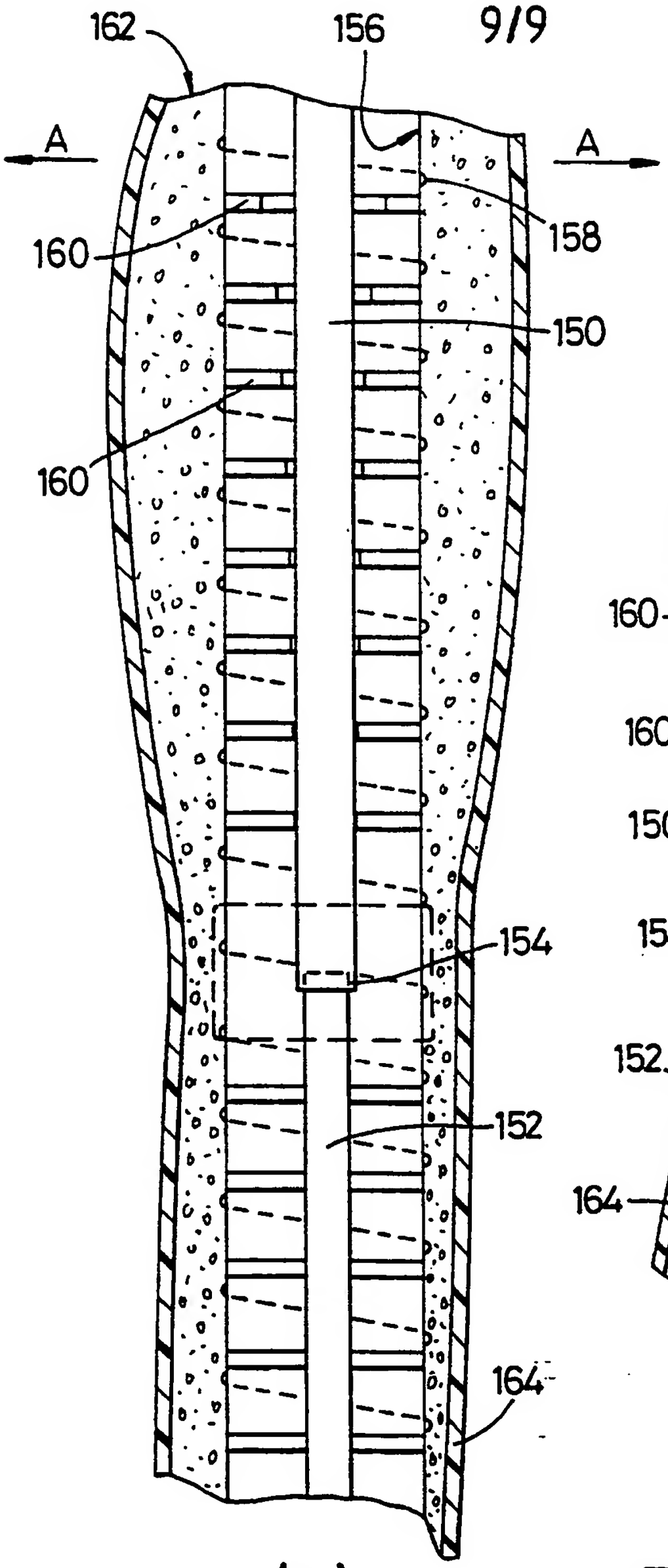
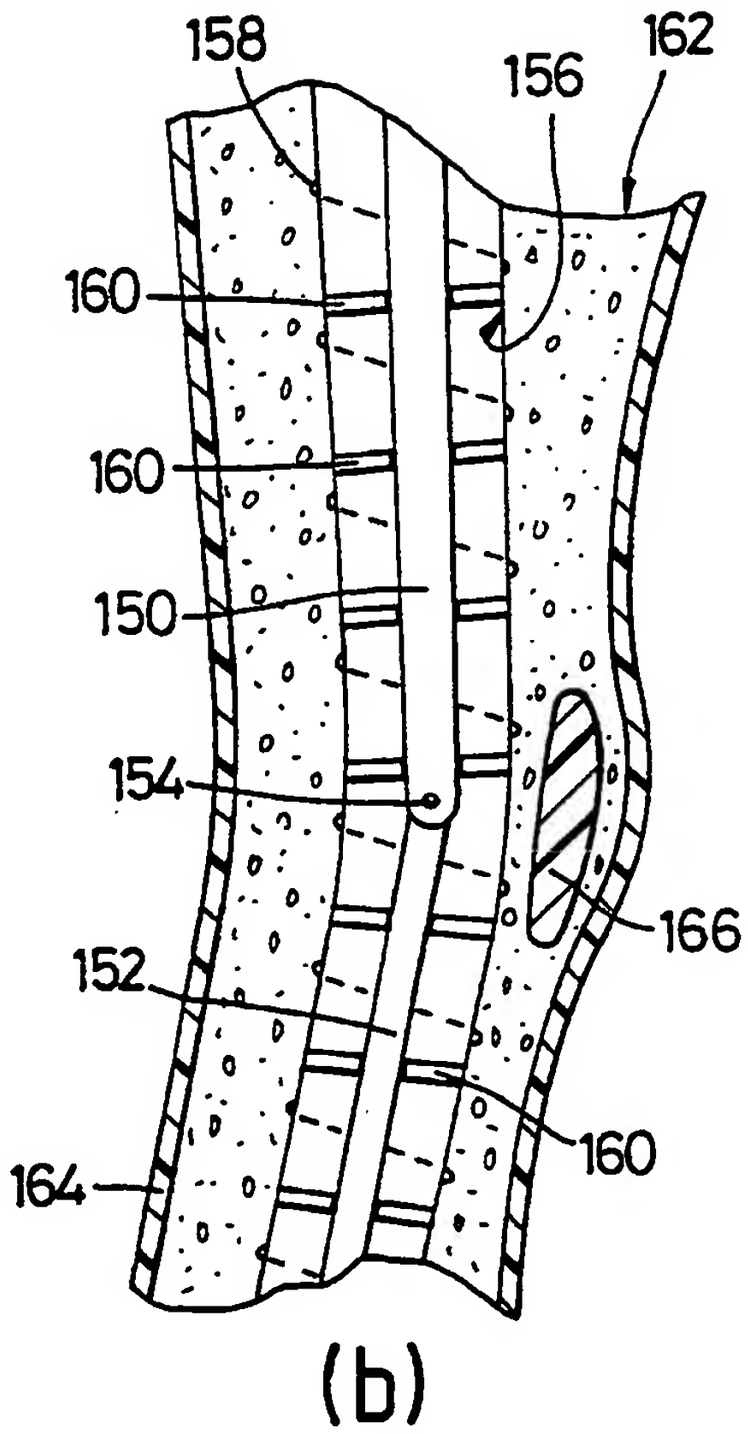

112
112
108
106
110
110
106
105
104
105
102
100
128
130
132
128
104
126
102
114
118
120
116
120
122
122

Fig. 8


162
156
A
A
158
160
150
160
154
152
164

(a)


158
156
162
160
160
150
154
166
152
160
164

(b)

Fig. 9